

BASIC ENERGY SCIENCES -- Serving the Present, Shaping the Future

Joint Meeting of User Facility Administrators and User Executive Committee Chairs

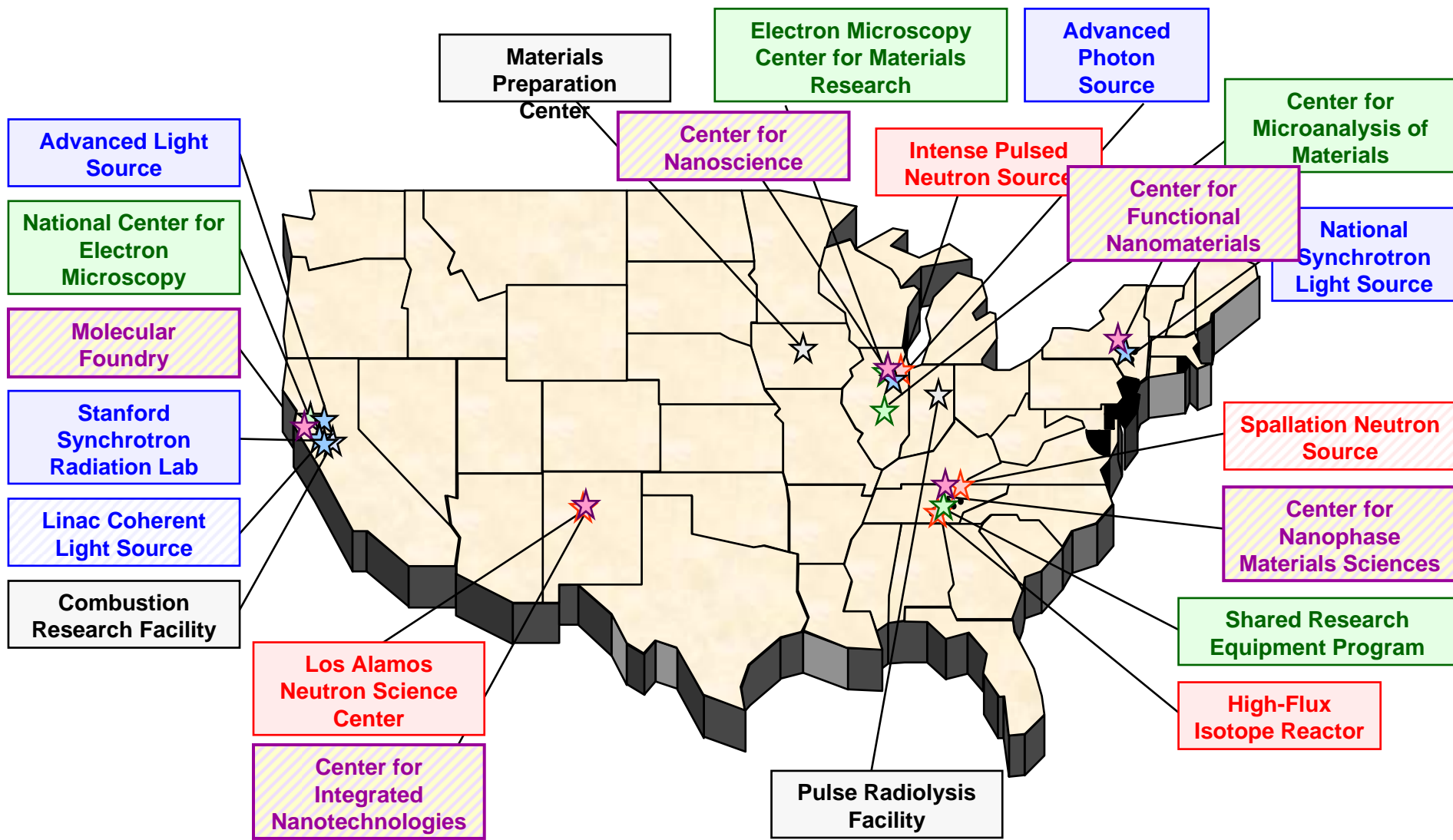
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Director
Scientific User Facilities Division
Basic Energy Sciences*

March 8-9, 2005

The Basic Energy Sciences Program ...

- ☐ *... is one of the Nation's largest sponsors of basic research.*
- ☐ *... supports research in more than 150 academic institutions and 13 DOE laboratories.*
- ☐ *... supports world-class scientific user facilities.*
- ☐ *... is uniquely responsible in the Federal government for supporting research in materials sciences, chemistry, geosciences, and aspects of biosciences related to energy resources, production, conversion, efficiency, and use – all in an environmentally conscientious manner.*

21 BES Scientific User Facilities, 2004



- 4 Synchrotron Radiation Light Sources
- Linac Coherent Light Source (underway)
- 4 High-Flux Neutron Sources (SNS under construction)
- 4 Electron Beam Microcharacterization Centers
- 5 Nanoscale Science Research Centers (PED and construction)
- 3 Special Purpose Centers

BES FY 2005 President's Budget Request

CONSTRUCTION

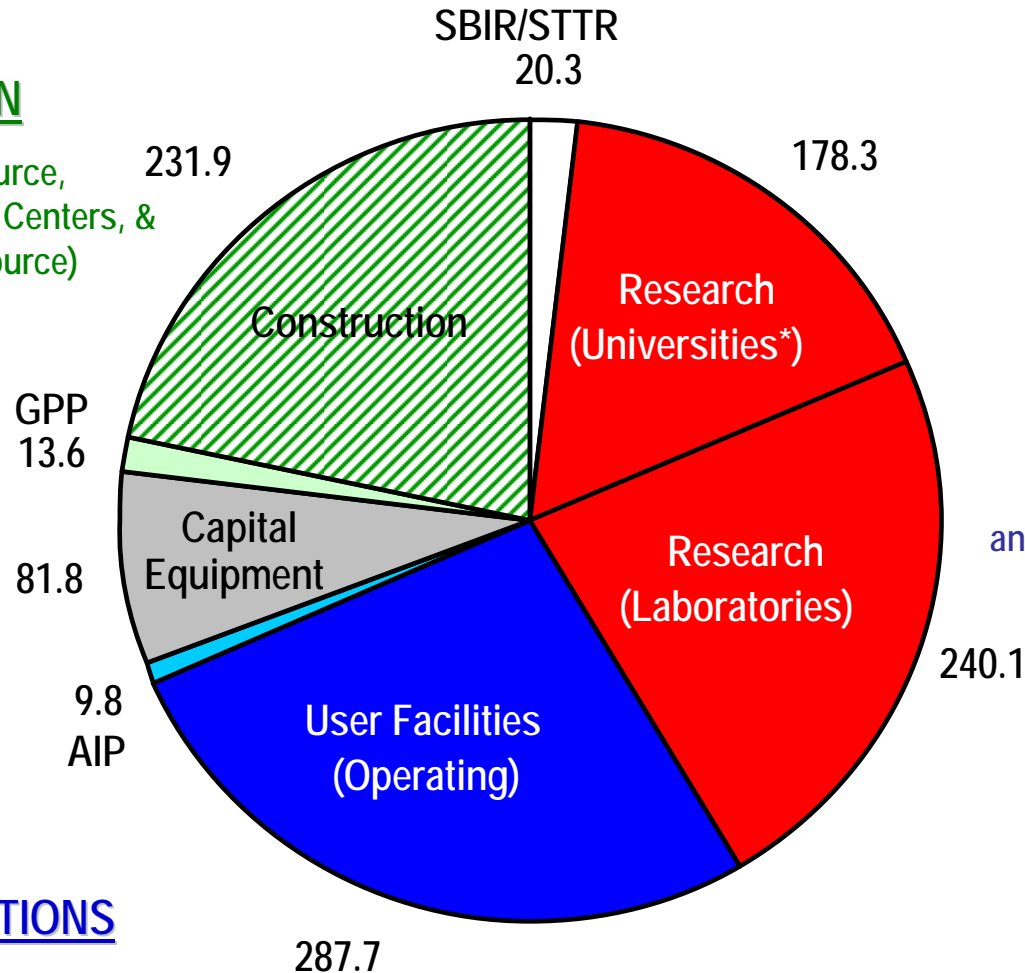
(Spallation Neutron Source,
Nanoscale Science Research Centers, &
Linac Coherent Light Source)

RESEARCH

(Materials Sciences and
Engineering Subprogram
&
Chemical Sciences,
Geosciences,
and Biosciences Subprogram)

FACILITY OPERATIONS

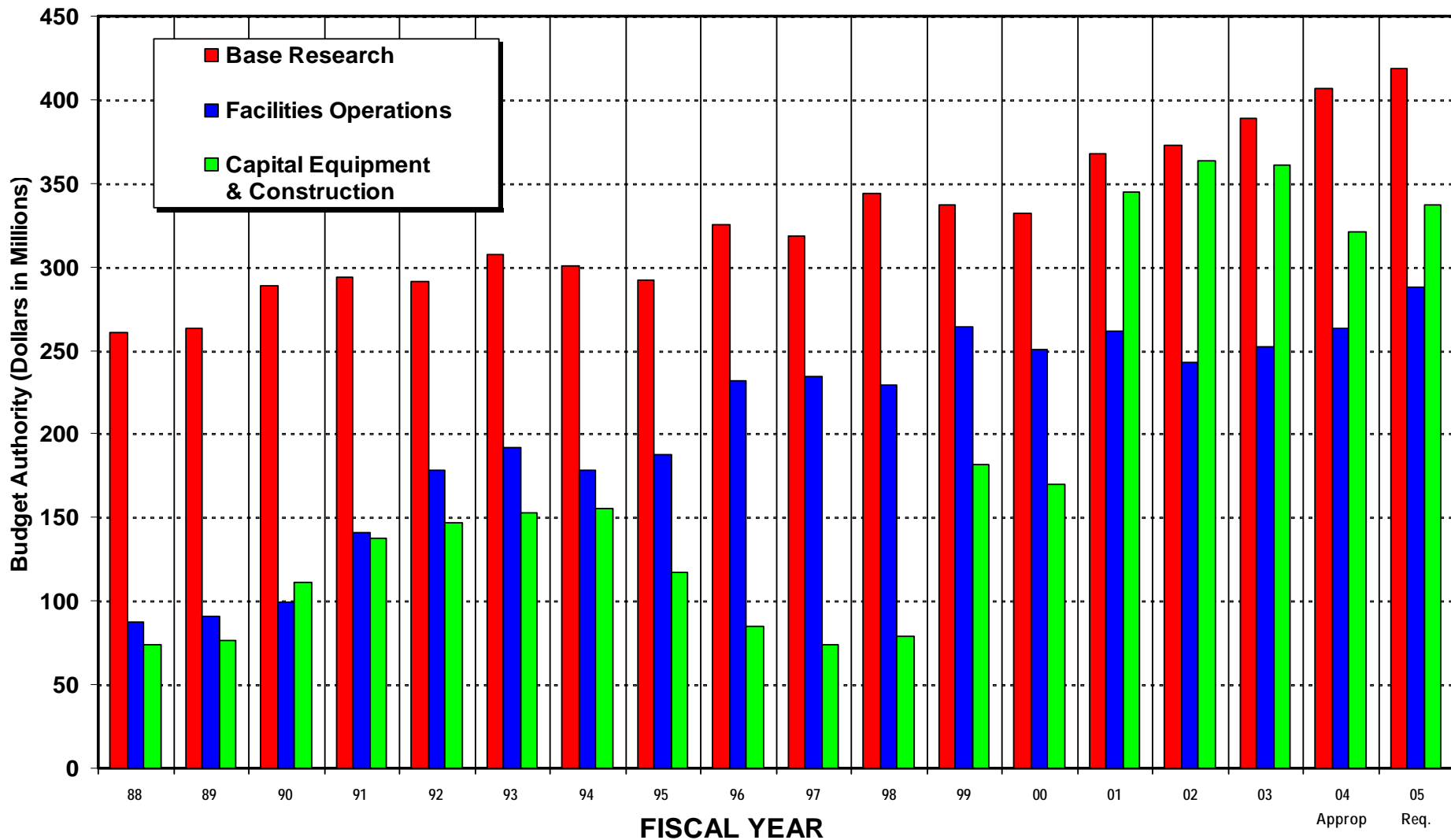
(X-ray and Neutron Scattering Facilities &
the Combustion Research Center)



B/A in millions of dollars

\$ 1,063.5

BES Funding Profile 1988-2005



BES Scientific User Facilities

Light sources

Stanford Synchrotron Radiation Laboratory & SPEAR3 upgrade (SLAC)

National Synchrotron Light Source (BNL)

Advanced Light Source (LBNL)

Advanced Photon Source (ANL)

Linac Coherent Light Source (SLAC) (under construction)

Neutron sources

Intense Pulsed Neutron Source (ANL)

Manuel Lujan, Jr. Neutron Scattering Center (LANL)

High Flux Isotope Reactor (ORNL)

Spallation Neutron Source (ORNL) (under construction)

Electron beam sources

Center for Microanalysis of Materials (Illinois)

Electron Microscopy Center for Materials Research (ANL)

National Center for Electron Microscopy (LBNL)

Shared Research Equipment Program (ORNL)

Nanoscale Science Research Centers (under construction)

Center for Nanophase Materials Sciences (ORNL)

Molecular Foundry (LBNL)

Center for Integrated Nanotechnologies (SNL/A & LANL)

Center for Functional Nanomaterials (BNL)

Center for Nanoscale Materials (ANL with State of Illinois contribution)

BES Facilities for X-ray and Neutron Scattering

Advanced Photon Source



Intense Pulsed Neutron Source



National Synchrotron Light Source

Advanced Light Source



Manuel Lujan Jr. Neutron Scattering Center



Stanford Synchrotron Radiation Laboratory



Spallation Neutron Source



High-Flux Isotope Reactor

Reviews of BES Facilities

Facilities are reviewed using (1) external, independent review committees operating according to the procedures established for peer review of BES laboratory programs and facilities (<http://www.science.doe.gov/bes/labreview.html>) or (2) subcommittees of BESAC.

BESAC subcommittees have reviewed the synchrotron radiation light sources, the neutron scattering facilities, and the electron-beam micro characterization facilities.

Regardless of whether a review is by an independent committee charged by BES or by a BESAC subcommittee, the review has standard elements. Important aspects of the reviews include assessments of the quality of research performed at the facility; the reliability and availability of the facility; user access policies and procedures; user satisfaction; facility staffing levels; R&D activities to advance the facility; management of the facility; and long-range goals of the facility.

These reviews have identified best practices and substantive issues. For example, the reviews highlighted the change that occurred as the light sources transitioned from a mode in which they served primarily expert users to one in which they served very large numbers of inexperienced users in a wide variety of disciplines.

Facilities that are in design or construction are reviewed according to procedures set down in DOE Order 413.3 *Program and Project Management for Capital Assets* and in the Office of Science *Independent Review Handbook*. These Office of Science construction project reviews, enlist experts in the technical scope of the facility under construction and its costing, scheduling, and construction management.

The Facilities are reviewed every three years.

- **The BES objective is to produce the best science possible at our facilities.**
- **The user community should have access to the facility using a proposal evaluation system that is fair and stimulate the performance of high quality research.**
- **The resources provided to the facilities should be used to optimize its utilization as well as the development of new and better techniques for the user community.**

Topics covered in the review:

- 1. Facility performance (schedules, users participation, etc)**
- 2. Selected presentations of the most outstanding research performed at the Facility during the last two years (by field of research)**
- 3. R&D plans and future scientific directions**
- 4. Laboratory plans that may affect the Facility**

The schedule should include time for the reviewers to meet individually with the facility scientific staff in their focus areas and additional areas of interest. A focus session with representatives of the users community without the laboratory management presence. The agenda and logistics for the review is coordinated with BES.

Information Requested from the Facility:

Facility

Brief description of the facility (one paragraph)

Provide a breakdown of all staff (permanent and temporary) and their assignments (personnel and budget allocation to each specific assignment): accelerator staff, facility instrument scientists, facility instrument operational staff, technicians and operators assign to users support, computing, clerical and administration.

Brief description of on going R&D activities at the facility: accelerator improvements, target improvements, instrument improvements, etc...

Instruments

Drawing of the floor plan, with a brief description of each instrument.

Describe the instruments available to users and percentage time allocated to outside users.

How many instruments are operational and what percentage of operational time is allocated to outside users.

Describe the communities served by each instrument (i.e. Biology, Materials Science, etc...)

Support facilities- sample preparation, computing capabilities, etc...

What is available?

What is planned?

Users

i. How is instrument time allocated to outside user?

ii. Reviewing process: A plot of the instrument time allocations per year vs. the number of groups receiving this time allotment (i.e. Materials Science, Biology, etc...). Also: user experiments per year, and proposals per year. Percentage of instrument time per year allocated to facility scientists.

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Impact

List all publications in the last three years in refereed journals only. This list should separate papers according to work performed by outside users or facility staff. Separate out conference proceedings.

List invited lectures and major awards for facility staff and outside users

List the twenty most important publications of work performed at the facility over the past three years, include Citation index.

Cost Indicator

Cost per paper (total cost of instruments operation/ number of papers per year)

Productivity per delivered beam day (number of papers per year/ delivered beam days)

Future

Describe in a brief statement the plans for future instruments and facility upgrade.

What are the priorities?

Identify potential problems- such as power costs and/or shortages, environmental contamination, etc.

What are the expected trends in user demand: internal, external and scientific area they represent (materials, chemistry, biology etc...).

The reviewer should provide an individual evaluation addressing the following issues:

- **Quality of the research performed at the facility in terms of quantity and impact of published research.**
- **Appropriateness and quality of the facility staff research and development (R&D) program.**
- **Satisfaction of the user community with the facility support and staff.**
- **Overall availability of quality beam time to the user community.**
- **Based on the data provided, comment on the user demand for the facility.**
- **Evaluate the proposal review process for beam time allocation, effectiveness and fairness.**
- **Evaluate the fairness in the distribution of beam time among users, i.e. facility staff vs. outside users.**
- **Evaluate the appropriateness of the instrumentation to satisfy the present and future needs of the user community.**
- **Evaluate the cost effectiveness of instrument operation, i.e. cost of operating a specific instrument in relation to its demand by users.**
- **Evaluate what is an appropriate level of research and development funding for efforts related to improving operations, accelerator, detectors, advanced instrumentation, etc...**
- **Evaluate the effectiveness of improving the scientific productivity in quantity and quality, support for facility R&D and/or direct support to the users?**
- **Evaluate how well is the present operational structure of each instrument working, in term of cost effectiveness, fairness in time distribution and scientific productivity.**
- **Cost effectiveness of the facility, publications, and scientific impact vs. cost of operation.**
- **Evaluate the role of the facility in the neutron scattering community at large?**
- **Comment on the expected future capabilities of the facility and specifically of its operational structure?**

Types of Users

General Users

Partner Users

Proprietary Users

Remote Users

Historical Development of the User Concept

General User (Independent User)

PRT

CAT

Proprietary User

Remote User

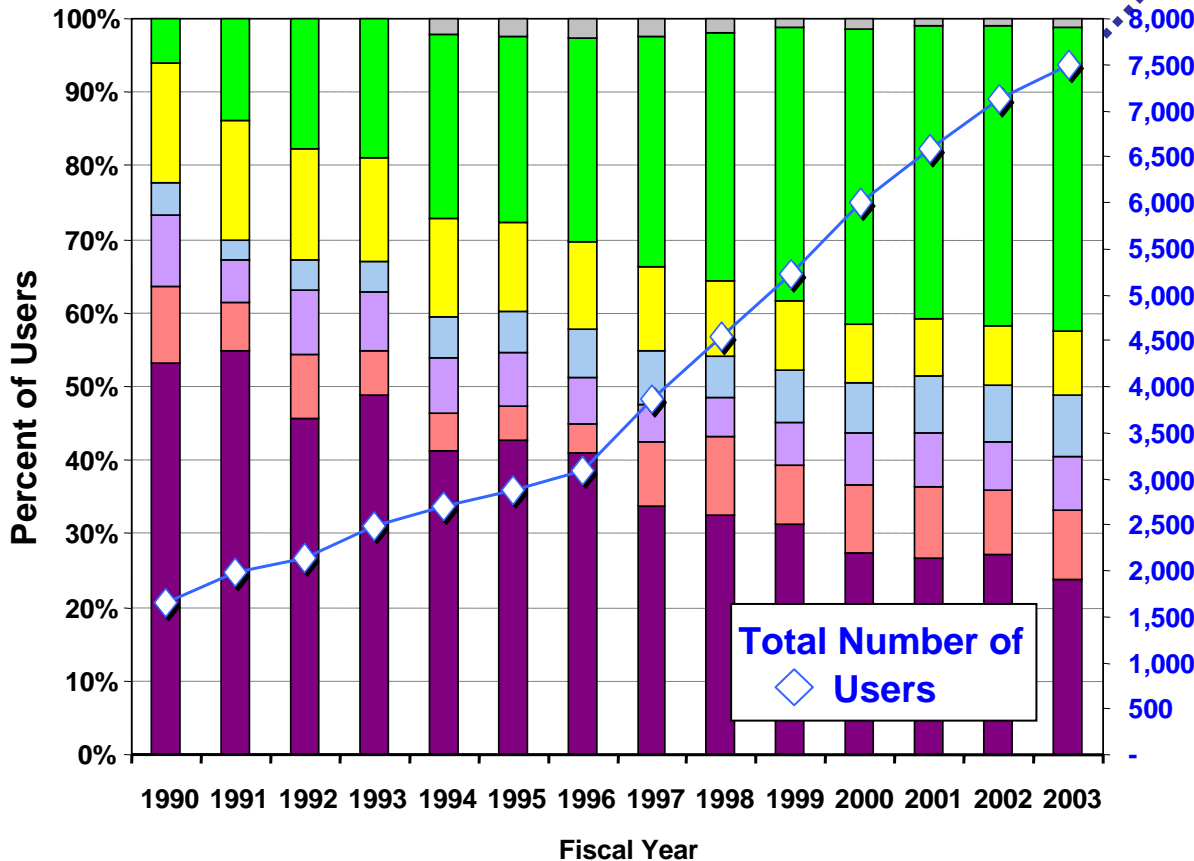
- Operate Instrument Remotely
- Send Samples and Analyze Data
- Other (e.g. institutions that receive products)

Spallation Neutron Source – User Access Policy

- All research will be peer reviewed.
- Time available to General Users (GU) will be maximized.
- Users participate in instrument specification, design, and fabrication through:
 - Instrument Advisory Teams (IATs) that work with SNS to provide input into the design and scientific program of each SNS project funded instrument.
 - Instrument Development Teams (IDTs) that work with SNS to obtain instruments that are funded outside of the SNS construction project. IDTs advise SNS on the conceptual design and construction of an instrument and are responsible for ensuring that the scientific requirements of the GU community are met.
- Both IAT and IDT instruments will have the majority of their beam-time allocated for the General User community through peer review of scientific proposals.
- DOE/BES will provide funds to operate the neutron source, most of the instruments regardless of how they are capitalized, and user support facilities.

Number of Light Source Users by Discipline

User Profile by Discipline of Experiments



The number of researchers using the light sources is expected to reach ~11,000 annually when beamlines are fully instrumented.

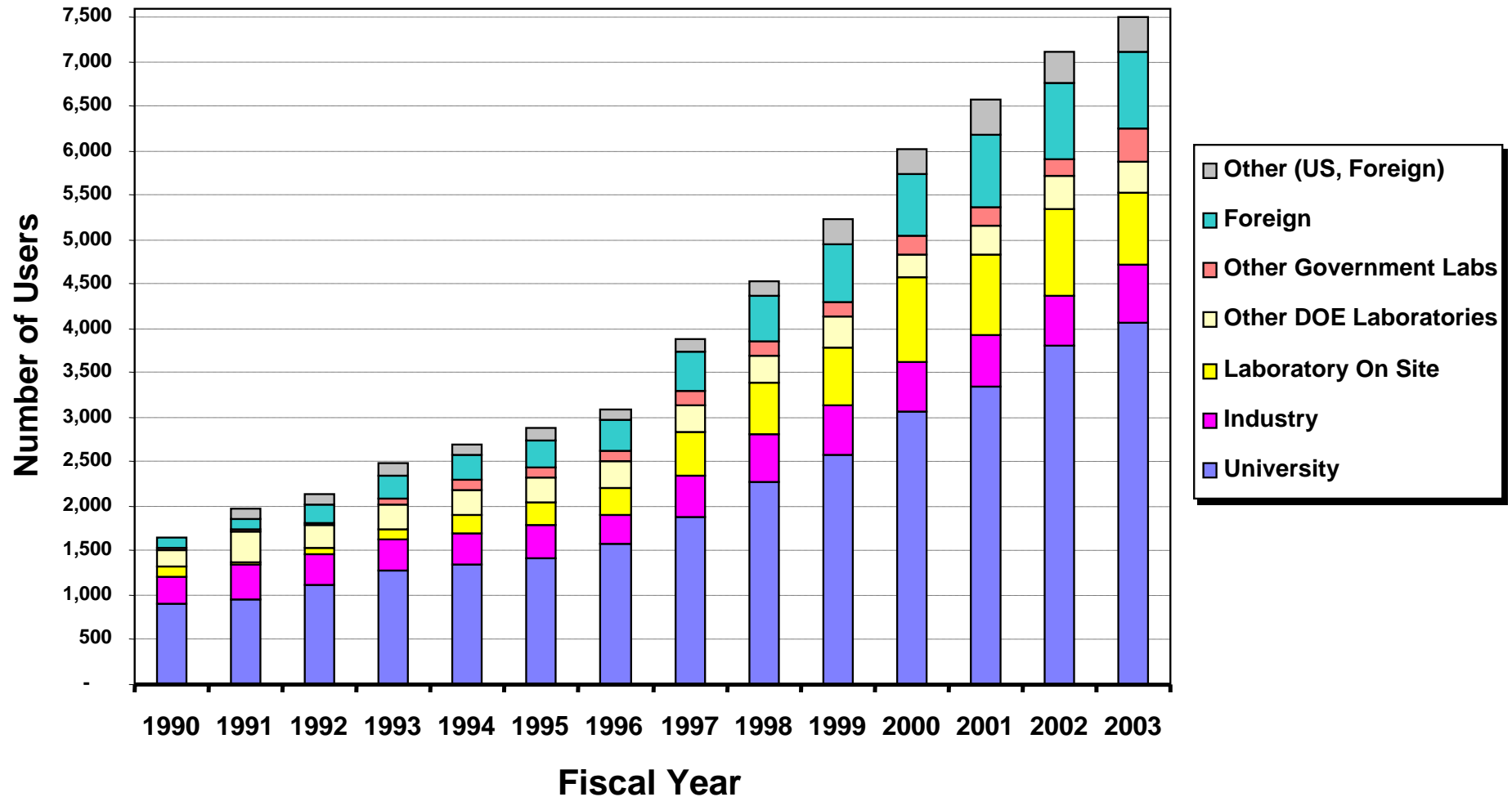
Who funds the light sources?

The Basic Energy Sciences program provides complete support for the operations of the facilities. Furthermore, BES continues as the dominant supporter of research in the physical sciences, providing as much as 85% of all federal funds for beamlines, instruments, and PI support. Many other agencies, industries, and private sponsors provide support for instrumentation and research in specialized areas such as protein crystallography.

- Other
- Life Sciences
- Chemical Sciences
- Geosciences & Environmental Science
- Applied Science/Engineering
- Optical/General Physics
- Materials Sciences
- Total Number of Users

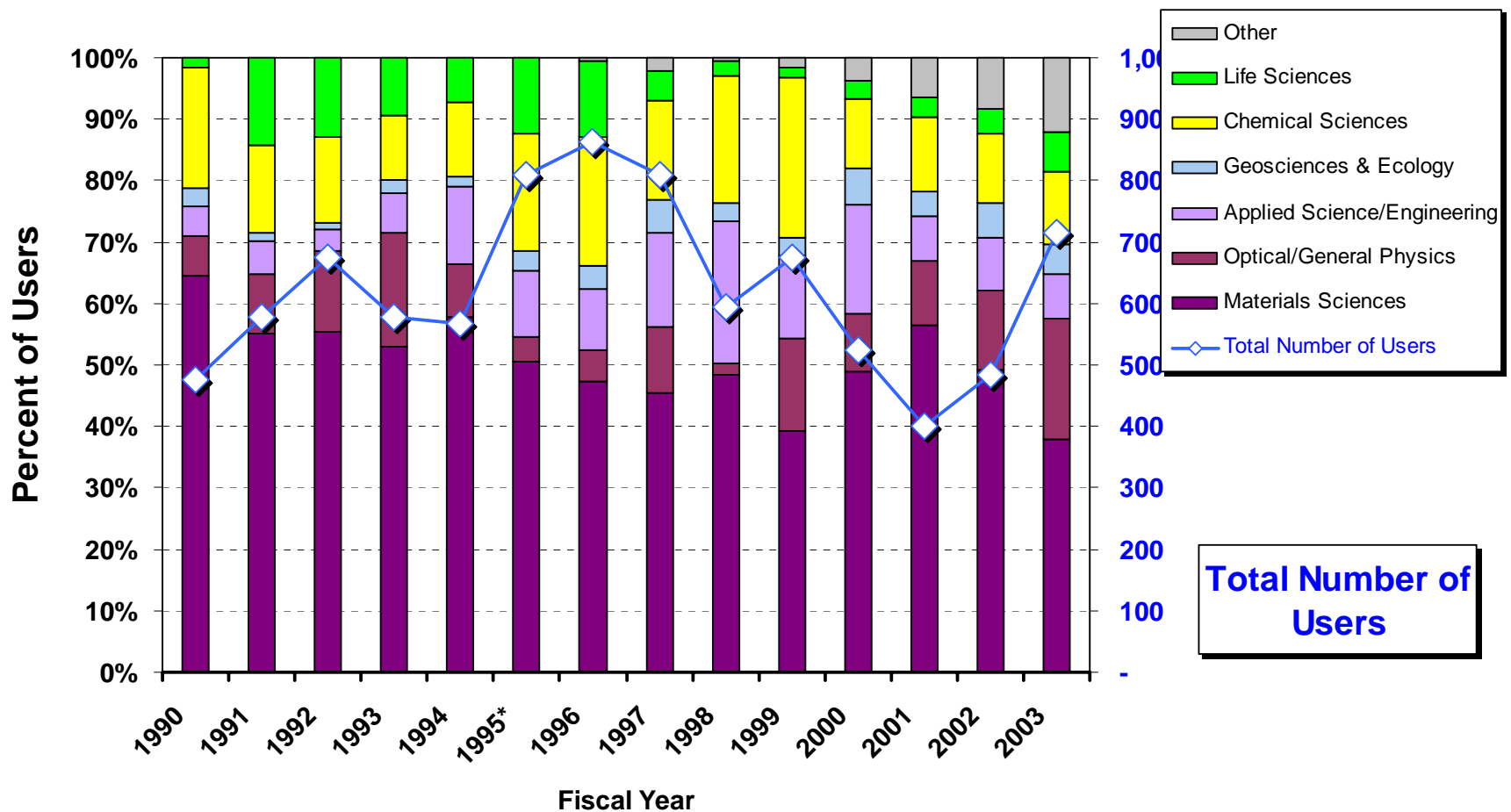
BES Light Sources – User Institutions

One half of the light source users come from academia.



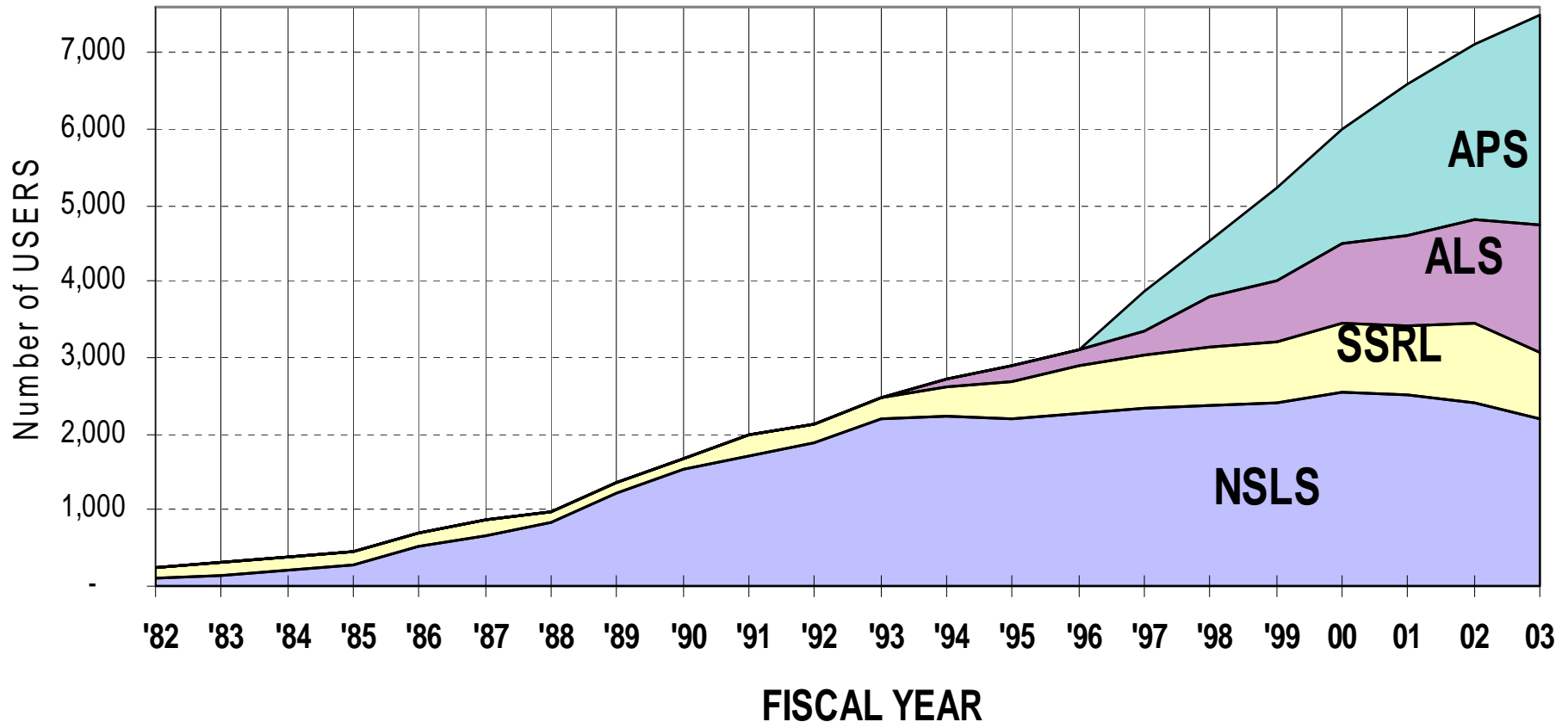
4 BES High-Flux Neutron Sources (HFBR, HFIR, IPNS and LANSCE)

User Profile by Discipline of Experiments



A brief history since the beginning of time

The picture version ...



User History of BES Synchrotron Radiation Light Sources